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To the Graduate Council:

I am submitting herewith a dissertation written by Zhou Yang entitled "Essays on Gross Receipts Taxes." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Economics.

William F. Fox and William S. Neilson, Major Professor

We have read this dissertation and recommend its acceptance:

Donald J. Bruce, LeAnn Luna

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Essays on Gross Receipts Taxes

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Zhou Yang

May 2011

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Dedication

This dissertation is dedicated to my parents and my sister. To my loving mum, Xiaomei Wu, who taught me from an early age the value of hard work and a good attitude toward life and who often remind me that the process of searching for answers is much more important than having an answer, I am very proud to be your daughter. To my loving sister, Fan Yang, who has a beautiful heart and has made me the happiest younger sister in the world, I am so lucky to be your sister. Also to my loving boyfriend, Liang Ying, who has always been very supportive of me, my life is wonderful with you.

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Abstract

The dissertation focuses on the incentives and economic effects of gross receipts taxes (GRTs) versus corporate income taxes (CITs). Conventional wisdom holds that GRTs are very poor tax instruments; however, several states have shown renewed interest in GRTs since 2002. An interesting question to ask is why states are reconsidering GRTs in spite of all criticisms. Are GRTs really as bad as what conventional wisdom says? There is little rigorous theoretical or empirical work on GRTs. My dissertation aims to help fill this gap by providing both theoretical and empirical analysis on the comparative advantages and disadvantages of GRTs versus CITs.

Essay one provides the first systematic theoretical analysis to compare and contrast the incentives and economic effects of gross receipts taxes versus corporate income taxes. Specifically, it focuses on the incentives for vertical integration in the sense of make-or-buy decisions, the effects on profit shifting between out-of-state and in-state firms, the incentives to change organizational form for tax purposes, and the incentives for cost-saving innovation under each tax system. Several results contradict conventional wisdom and deepen our understanding of GRTs. Based on Essay one, Essay two empirically tests the theoretical prediction that GRTs eliminate the distortion on organizational form choice, increasing the chance for a firm to incorporate. The analysis uses state-industry panel data from Nonemployer Statistics during the period 2002- 2008. The results show that states with a GRT have a higher share of corporate firms. Further, by replacing the CIT with a GRT, states may promote the real activity of C corporations.

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Chapter 1

A New Look at Gross Receipts Taxes: A Theoretical Analysis

1.1 Introduction

How to tax business has been and will always be a question at the center of tax policy debates. Several researchers have argued that the ideal subnational business tax vehicle is an origin-based value added tax.¹ However, this has not proven to be politically possible in the US, especially at the state level.² Instead, states choose between corporate income taxes (CITs) which tax the profits of certain companies and gross receipts taxes (GRTs) which tax the gross revenues of all transactions within the state.³ Both types of taxes may distort economic behavior. According to the conventional wisdom, CITs influence firms' choices on location, investment, and organizational form; while GRTs cause tax pyramiding, encourage artificial vertical

¹See Oakland and Testa (1996) for details.

²New Hampshire is the only state that currently has a business enterprise tax very similar to a value added tax (VAT). Michigan has recently phased out its VAT-like Single Business Tax and many other states have considered but failed to adopt a VAT.

³States have also considered net receipts taxes. The California Commission on the 21st Century Economy recently proposed a Business Net Receipts Tax. In general, GRTs do not allow deductions for input costs, but net receipts taxes allow deductions for certain non-labor inputs.

integration, and alter the prices of intermediate inputs. GRTs are viewed as especially poor tax vehicles among most tax economists.

Over the past several decades, there has been a significant trend for states to move towards a single-sales factor apportionment for CITs, which means the tax burdens are apportioned across states on the basis of gross receipts. At the same time, states have begun showing renewed interest in using GRTs directly as the instruments to tax business, in spite of the criticisms. Whether to replace the current tax structure with a GRT structure is at the center of heated policy debates concerning the direction of state fiscal systems. Nevertheless, little has been done to systematically analyze GRTs as a replacement for CITs. This paper is the first to provide a careful theoretical study of the relative performance of GRTs versus CITs from several interesting perspectives.

Unlike a corporate income tax, which applies only to corporations with positive profits, a gross receipts tax generally applies to all business entities, including regular corporations, S corporations, limited liability companies, partnerships, and sole proprietorships.⁴ States last embraced GRTs during the Great Depression in order to generate enough revenue to keep key government services functioning. In the wake of strong criticisms, state use of GRTs declined in the latter half of the twentieth century. By 2002, only Delaware and Washington imposed significant gross receipts taxes.⁵ However, instead of fading away, since 2002 six states, Kentucky, Michigan, New Jersey, Ohio, Oklahoma and Texas, have levied certain forms of GRT, and five other states, California, Illinois, Maine, Montana, and Rhode Island, have considered modified GRTs.⁶ An interesting question to ask is why states adopted GRTs if they are such poor tax instruments.

There has been little theoretical and empirical literature on GRTs, although GRTs have generated a lot of discussion, mostly highlighting the long-standing

⁴By definition, a corporate income tax applies to C corporations, but some states have extended the tax to S corporations and limited liability companies.

⁵New Mexico's GRT is better viewed as a broad-based sales tax.

⁶Kentucky and New Jersey used gross receipts as an alternative minimum assessment in their corporate income tax structure. See Appendix B for more details. Oklahoma just imposed a modified GRT in 2010.

criticisms of GRTs based on standard principles of taxation—economic neutrality, competitiveness, fairness, and transparency (McLure, 2005a 2005b; Mikesell, 2007a 2007b; Chamberlain and Fleenor, 2006). Two recent papers provide valuable discussions on advantages and disadvantages of GRTs over alternative taxes. Testa and Mattoon (2007) summarize the advantages and disadvantages of GRTs along three dimensions—as a stand alone tax against standard tax principles, as a replacement for an existing business tax, and as a corrective “fill-in” tax to rebalance a state’s tax system. They conclude that an origin-based value added tax is the first-best choice, not a GRT. Pogue (2007) argues that a GRT is one way to move towards a less complicated tax that applies to more forms of business organization and more sectors of the economy, however, a GRT is not an ideal business tax because gross receipts do not reflect the social costs of their business activities well. Alm, Blackwell, and McKee (2004) take a different approach by examining the tax audit and tax compliance behavior associated with the GRT in New Mexico. Because New Mexico’s GRT is better viewed as a broad-based sales tax, the analysis is in the framework of firm compliance with sales taxes.

In general, criticisms of GRTs do not consider characteristics of the market structure and arrangements of corporate profits. In addition, many of the evaluations of GRTs are not carefully considered in relation to what they are replacing. Given that we are not living in the first-best world, GRTs should not be evaluated entirely from a standpoint of an ideal world and the analysis should focus more on the comparative disadvantages and advantages in relation to feasible alternatives. Regardless of all critiques, GRTs have been recently enacted or considered in a number of states, indicating a perceived need for an alternative approach to business taxation. The question addressed in this paper is how GRTs perform relative to the CITs that they often replace.

To carefully examine the potential effects of GRTs, this paper constructs theoretical models to compare and contrast the incentives and economic effects

of a corporate income tax with a single sales factor versus gross receipts taxes.⁷ Specifically, a basic model is constructed and then extended to examine various aspects of GRTs to explore differential incentives under a GRT versus a CIT. This allows me to look at different facets of the problem, particularly the incentive for vertical integration in the sense of make-or-buy decisions, the effect on profit shifting between out-of-state and in-state firms, the incentive to change organizational form for tax purposes, and the incentive for cost-saving innovation. I then investigate the influence of different market structures and the role that bargaining power between the upstream and downstream firms plays in the analysis. The purpose of this paper is to understand the relative impacts of GRTs versus CITs and to investigate whether GRTs offer any potential benefits. Interestingly, this paper shows that GRTs are not as bad as the conventional wisdom says and in some cases, GRTs actually result in a reverse of what has often been argued.

First of all, GRTs do not always create different incentives for vertical integration than those under CITs. If firms prefer making their own inputs to buying from the upstream firm under a GRT, they would also do so under a CIT. However, in some cases, firms would prefer buying the inputs under a GRT but making their own inputs under a CIT. Hence, rather than encouraging vertical integration, as other researchers have claimed, GRTs might actually reduce the incentive for vertical integration.

Furthermore, GRTs make it possible to shift profits from out-of state firms to in-state firms. In a model where two states initially have single-sales factor apportionment CITs, the home state can transfer profits from out-of-state upstream manufacturers to in-state retailers when the home state replaces the CIT with a GRT.

In addition, GRTs help eliminate the distortion on organizational form choice arising under CITs and possibly lower the prices of final goods. GRTs do not create the incentive for firms to be non-corporate entities for tax purposes. Specifically, under a CIT, firms may choose to be S corporations, LLCs, or other pass-through

⁷By 2008, eleven states used a single sales factor apportionment formula and several other states applied more than equal weight to the sales factor. In general, most CIT states are moving towards a single sales factor apportionment formula.

entities instead of C corporations to avoid the tax, but they are not able to do so under GRTs since all companies are subject to the tax. Furthermore, given the benefit of easier access to capital markets for many C corporations, prices of the final goods might be even lower under a GRT if non-corporate entities find it favorable to become C corporations. Consequently, GRTs do not necessarily lead to higher prices of the final goods than CITs.

On the other hand, GRTs create less incentives for cost-saving innovation than CITs. GRTs reduce firms' effective marginal benefit of investment on innovation while CITs reduce the gross marginal benefit and marginal cost at the same time, leaving the effective marginal benefit unchanged. As a result, firms have less incentive to innovate under GRTs than under CITs.

The remainder of this paper is organized as follows. Section 2 provides a basic model framework for the analysis. Section 3 explores the incentives to integrate along the vertical chain under a GRT versus under a CIT. Section 4 examines profit shifting from out-of-state firms to in-state firms when the home state replaces a CIT with a GRT. Section 5 extends the model to explore the incentive to change organizational form and the associated economic impacts. Section 6 investigates the incentive to invest in cost-saving innovations. Section 7 studies the impact of varying the downstream market structure on previous results. Section 8 discusses how different distributions of bargaining power between the upstream and downstream firms could change the results. Section 9 offers a brief conclusion with a discussion of limitations and possible future research.

1.2 The Model Framework

The general setup of the baseline model is as follows.⁸ Consider a model where the upstream monopoly firm produces an intermediate good and sells to a downstream

⁸The model is based on a standard model in the vertical integration literature. See Tirole (1988) for further discussion.

monopoly firm.⁹ Denote the price for the intermediate good as W . Let c^{up} be the upstream monopoly's marginal cost of producing the intermediate good. Assume the downstream firm buys the input only from the upstream monopoly and sells the final good at price P . For simplicity, the marginal cost of processing the intermediate good to the final good is zero, and each unit of the final good requires one unit of the intermediate good. This assumption is relaxed in later modifications of the model. The demand for the final good is linear, $P = 1 - q$. In addition, it is assumed that it is not practical for either the downstream firm or the upstream firm to merge into one firm.

Without a tax, the downstream firm solves the following problem:

$$\underset{q}{Max} (1 - q)q - Wq. \quad (1.1)$$

The solution from the first order condition is $q^{NT} = \frac{1-W}{2}$, which is the demand for the intermediate good, where the superscript NT denotes the no-tax case.

The upstream firm maximizes its profit:

$$\underset{W}{Max} (W - c^{up})q^{NT}. \quad (1.2)$$

The first order condition yields,

$$W^{NT} = \frac{1+c^{up}}{2},$$

and thus, the price of the downstream good,

$$P^{NT} = \frac{3+c^{up}}{4}.$$

⁹For simplicity, I assume the upstream monopoly only produces one intermediate good here, however, the monopoly could produce several goods and as long as the goods are unrelated, it would not affect the nature of the problem.

The framework above provides the basic structure of the model assuming no tax on businesses. In the analyses below, I look at the cases under two tax regimes, a CIT and a GRT, and compare the results under the two tax systems. Furthermore, model assumptions, including the assumptions on market structure, marginal cost of production, and other aspects, are later relaxed, and the model is modified in various ways to examine different aspects of relative impacts of GRTs versus CITs.

1.3 Incentives for Vertical Integration

The incentive to vertically integrate has been one of the biggest concerns in the discussion on GRTs. The major argument is that GRTs tax gross revenues at each stage of the production process, creating extra layers of taxation along the supply chain, a phenomenon called tax pyramiding. The conventional wisdom argues that GRTs create an incentive for vertical integration. However, most of the criticism does not carefully consider the market structure and how firms along the supply chain respond to each other. What happens if GRTs affect firms' pricing behavior along the supply chain?

Before moving on to the analysis, it is important to clarify the type of vertical integration addressed in the paper. Vertical integration generally refers to the process in which several steps in the production and/or distribution of a product or service are controlled by a single company or entity. The most familiar form of vertical integration is the merging together of two businesses that are at different stages of production—for example, the merger between Time Warner Incorporated, a major cable operation, and Turner Corporation, which produces CNN, TBS, and other programming. In this case, vertical integration is the degree to which a firm owns its upstream suppliers and/or its downstream buyers. However, there is another form of vertical integration. A firm can integrate different stages of the production process into its own production and perform the upstream supplier's activity itself without buying the upstream firm. For instance, Toshiba, a global company producing

electronic products, generally uses its own batteries rather than buying from other firms because it is cheaper to do so. However, as a counterexample, Haixin, a Chinese TV producer, generally buys the chips from Toshiba since Toshiba produces the chips on a large scale and enjoys economies of scale. It is much cheaper for Haixin to buy instead of make. This paper focuses on the latter type of vertical integration. Specifically, it explores how the make-or-buy decision differs for the downstream firm under a GRT versus under a CIT.

The analysis first looks at “make” and “buy” cases under both tax systems and then compares the results under both taxes for the “make” and “buy” cases. Begin with the “buy” case. With a CIT at rate t , firms solve the following problems: the downstream firm maximizes net profit, $\underset{q}{Max} (1-t)[(1-q)q - Wq]$, yielding output q^{CIT} ; the upstream firm then solves $\underset{W}{Max} (1-t)(Wq^{CIT} - c^{up}q^{CIT})$.¹⁰ Comparing these problems with (1.1) and (1.2) in the baseline model, one can see that the objective functions under a CIT are simply multiples of the no-tax ones. Therefore, a CIT does not distort firms’ decisions and the solutions are the same as those in the no-tax case.

Now suppose that instead of a CIT the state government imposes a GRT at the tax rate t on gross receipts.¹¹ The downstream firm maximizes the after-tax profit, $\underset{q}{Max} (1-t)(1-q)q - Wq$, and the resulting output level is denoted q^{GRT} . The upstream firm’s problem is $\underset{W}{Max} (1-t)Wq^{GRT} - c^{up}q^{GRT}$. Solving the maximization problems yields

$$W^{GRT} = \frac{1-t}{2} + \frac{c^{up}}{2(1-t)},$$

and

$$P^{GRT} = \frac{3}{4} + \frac{c^{up}}{4(1-t)^2}.$$

Comparing these to W^{NT} and P^{NT} , one can prove the following result.

¹⁰Assume all goods are sold in one state.

¹¹The result is also robust to the revenue-neutral GRT rate.

Lemma 1. *As long as the after-tax price of the final good under a GRT is greater than the cost of the intermediate good, a GRT drives up the price of the final good but lowers the price of the intermediate good.*

Proof Given that $(1 - t)P > c^{up}$, and $P < 1$, it must be true that $1 - t > c^{up}$.¹² Subtracting the two equilibrium input prices yields

$$W^{NT} - W^{GRT} = \frac{t}{1 - t} \cdot \frac{1 - t - c^{up}}{2} > 0.$$

Subtracting the two equilibrium final good prices yields

$$P^{GRT} - P^{NT} = \frac{t}{(1 - t)^2} \cdot \frac{(2 - t)c^{up}}{4} > 0.$$

■

Given that the GRT reduces the input price, it potentially impacts the downstream firm's decision to make or buy.¹³ For the “make” case, assume that the downstream firm can make its own input at a constant marginal cost $c^{down} > c^{up}$.¹⁴ If it makes its own input, the problem becomes $\underset{q}{Max} (1 - t)(1 - q)q - c^{down}q$ with a GRT and $\underset{q}{Max} (1 - t)[(1 - q)q - c^{down}q]$ with a CIT. Finally, comparing the marginal cost of making the input with that of buying the input under both tax systems, along with the associated profit differences yields the following result.

¹²The condition for profitability is $(1 - t)^2 > c^{up}$. If firms earn any positive profits, $1 - t > c^{up}$ will be automatically satisfied.

¹³Lemma 1 still holds even in the presence of the federal corporate income tax (t_c^f). In this case, under a CIT, downstream firm's objective function becomes $\underset{q}{Max} (1 - t_c^f)(1 - t)[(1 - q)q - Wq]$, while upstream firm's one becomes $\underset{W}{Max} (1 - t_c^f)(1 - t)(Wq^{CIT} - c^{up}q^{CIT})$. The solutions under the CIT would be the same as if there is no federal corporate income tax. Under a GRT, with the federal corporate income tax, the downstream's problem is: $\underset{q}{Max} (1 - t)(1 - q)q - Wq - t_c^f[(1 - q)q - Wq]$, while the upstream firm's one is: $\underset{W}{Max} (1 - t)Wq^{GRT} - c^{up}q^{GRT} - t_c^f(Wq^{GRT} - c^{up}q^{GRT})$. As long as firms make any positive profits under a GRT, the results, $P^{GRT} > P^{CIT}$ and $W^{GRT} < W^{CIT}$, will always be true. The proof is similar to the one above.

¹⁴Otherwise, the downstream firm would not think of buying from other firms.

Proposition 1 *There exist situations in which the downstream firm makes its own input under a CIT but buys under a GRT, but there do not exist situations under which the downstream firm makes under a GRT but buys under a CIT.*

Proof Recall from Lemma 1 that $W^{GRT} < W^{NT}$ for any positive profits, and that the equilibrium intermediate good price is W^{NT} under a CIT. If $c^{down} < W^{GRT}$, then the firm makes its own input under both tax regimes. If $W^{GRT} < c^{down} < W^{NT}$, the downstream firm makes the intermediate good under a CIT but buys the intermediate good under a GRT. Although it is cheaper to buy the input under a GRT, since making the input can eliminate the double marginalization, a check is necessary to guarantee that buying the input results in a higher net profit than making its own under the GRT. Using the solutions from the maximization problems, the after-tax profits in both make and buy cases under the GRT are: $\pi_{buy}^{GRT} = \frac{[(1-t)^2 - c^{up}]^2}{16(1-t)^3}$ and $\pi_{make}^{GRT} = \frac{[1-t-c^{down}]^2}{4(1-t)}$. The condition $W^{GRT} < c^{down}$ can be rearranged to yield

$$2(1-t-c^{down}) < \frac{(1-t)^2 - c^{up}}{1-t}.$$

Then, the following is true:

$$\pi_{buy}^{GRT} = \frac{1}{16(1-t)} \cdot \left(\frac{[(1-t)^2 - c^{up}]}{(1-t)} \right)^2 > \frac{1}{16(1-t)} \cdot [2(1-t-c^{down})]^2 = \pi_{make}^{GRT}.$$

Thus, the downstream firm would rather buy the input from the upstream firm than make the input. If $W^{NT} < c^{down}$, the firm buys under both tax regimes. As in the previous case, I need to compare the net profits in both make and buy cases under the CIT, that is, $\pi_{buy}^{CIT} = (1-t)(\frac{1-c^{up}}{4})^2$ and $\pi_{make}^{CIT} = (1-t)(\frac{1-c^{down}}{2})^2$. The condition $W^{NT} < c^{down}$ can be rearranged to yield

$$\frac{1-c^{up}}{4} > \frac{1-c^{down}}{2}.$$

Therefore,

$$\pi_{buy}^{CIT} = (1 - t) \cdot \left(\frac{1 - c^{up}}{4}\right)^2 > (1 - t) \cdot \left(\frac{1 - c^{down}}{2}\right)^2 = \pi_{make}^{CIT}.$$

■

Conceptually, the most common criticism on GRTs is the incentive for vertical integration. Nevertheless, the analysis above shows that this might not be true when considering characteristics of the market structure and how GRTs influence firms' pricing decision for the intermediate good. Instead of providing a greater incentive to vertically integrate, a GRT provides less incentive when it drives down the price of the input to the point that it is cheaper to buy than make its own. This result contradicts the conventional wisdom and calls for careful investigation of the effects of GRTs. Whether this result still holds in other market structures raises a question and is explored in Section 7 which focuses on the impact of varying downstream market structure on the results.

1.4 Profit Shifting

The decline of CIT revenue and its well-known distortions on investments and location choices push states to look for alternative ways to tax businesses. When it comes to enacting a new tax to replace the existing one, policy makers must consider how businesses react to the policy change. Particularly, when transactions involve firms located in different states, it is necessary for the state government to bear in mind how in-state firms would be affected by the new tax. The question remains why states have begun showing renewed interest in a GRT, although the tax has been criticized for a long time as a poor tax instrument. A first glimpse of GRTs seems to suggest that the input price for in-state firms increases due to tax pyramiding. Nevertheless, as shown in Lemma 1, the price of the intermediate good is actually lower under a GRT than a CIT. One might ponder how the tax change would affect upstream and

downstream firms differently. What are the implications for the distribution of profits across states when the upstream and downstream firms are located in different states?

To answer these questions, the baseline model is slightly modified. Consider two states, state 1 and state 2, where state 1 is the home state where the final goods are sold. The upstream monopoly manufacturer is in state 2, which produces the goods at a constant marginal cost, c^{up} , and sells products to the monopoly retailer in state 1. Initially, both states have a single sales factor apportionment corporate income tax.¹⁵ Both upstream and downstream firms are taxable entities under a CIT.

With a CIT, the problems for the upstream and downstream firms are the same as in (1.1) and (1.2). To see how GRTs might influence the market differently from the perspective of the home state, assume the home state government enacts a GRT to replace the CIT, which generates the same tax revenue as before at a tax rate t^{GRT} . The downstream and upstream firms maximize the after-tax profits similar to those in the previous section. The maximization solutions yield W^{GRT} and P^{GRT} . Comparing the profits under a CIT with the profits under a GRT for firms located in each state leads to the proposition below.

Proposition 2 *Switching to a GRT from a CIT, the home state shifts the profit from the out-of-state upstream firm to in-state downstream firms if the revenue neutral t^{GRT} is sufficiently low.*

Proof *See Appendix A.* ■

The profit shifting result potentially comes from two sources, an increase in the price of the final good and a decrease in the price of the intermediate good. However, since a monopoly operates on the elastic part of the demand curve, the increase in price will actually decrease the sales revenue. Therefore, the primary driver of this profit shifting result is the fact that the out-of-state upstream firm lowers the

¹⁵Under a single sales factor apportionment formula, the share of a corporation's total profit that a particular state would tax would be based solely on the share of the corporation's nationwide sales occurring in the state. Also, it is assumed that the manufacturer can be taxed by state 1 according to the nexus requirement.

input price it charges the in-state downstream firm. Consequently, the out-of-state upstream firm's profit decreases and it flows to the in-state downstream firm when the home state replaces a CIT with a GRT.

The analysis above explores the possibility that the home state can change the profit distribution across states by replacing the current CIT to a GRT. Specifically, when the downstream firm is located in the home state, the home state replacing a CIT with a GRT can bring in more profits.

1.5 Choice of Organizational Form

The discussions above focus on criticisms of GRTs and show that the relative performance of GRTs is not necessarily that bad. One reason why states might favor a GRT is broadening the tax base. Corporate income taxes apply only to corporations earning positive profits, and pass-through entities are generally not subject to CITs. Therefore, firms have the incentive to distort their organizational forms to avoid income taxes under CITs. However, unlike CITs, GRTs typically apply to almost all business entities, including C corporations, S corporations, limited liability companies, partnerships, and sole proprietorships. One would expect that the incentive to choose organizational form for tax purposes would be eliminated under GRTs. In this section, the incentive to change organizational form and the associated impacts on the price of the final good under a GRT versus a CIT are investigated. As in the previous analysis, both states start with a single sales factor apportionment CIT and then the home state switches to a GRT.

The assumption of zero marginal cost for the downstream firm is relaxed in this extension of the basic model. The downstream retailer now incurs a marginal cost of transferring the intermediate good into the final good. As discussed earlier, under CITs, pass-through entities are not subject to taxes while C corporations are. However, C corporations are able to have as many shareholders as possible, which

allows them to have easier access to capital at relatively lower prices.¹⁶ For the purposes of the model, the increased access to capital markets manifests itself in lower marginal costs for C corporations than for non-corporate firms. Further, the downstream retailer is initially a non-taxable entity under the CIT, such as an S corporation or LLC. As in the previous scenario, both states initially have a single sales factor apportionment CIT.

For simplicity, assume the downstream retailer has a constant marginal cost. The marginal cost is c_L if the retailer is a C corporation, and c_H if an S corporation, where $c_L < c_H$.¹⁷ The retailer initially has a marginal cost of c_H based on the presumption that the benefit of reducing tax liability is greater than the cost saving of incorporation. As in the previous case, the monopoly retailer buys products from the manufacturer in state 2 and sells the final good in state 1 (home state). The market demand for the final good is $P = 1 - q$. The wholesale price that the manufacturer charges the retailer is W_H .

With the same approach, solving both firms' problems yields the solutions: $W_H^{CIT} = \frac{1}{2}(1 + c^{up} - c_H)$ and $P^{CIT} = \frac{1}{4}(3 + c^{up} + c_H)$.¹⁸ Hence, the retailer's profit is $\frac{1}{16}(1 - c^{up} - c_H)^2 = (q_H^{CIT})^2$.

When the home state enacts a GRT to replace the CIT at a revenue-neutral rate t^{GRT} , the benefit from being a non-corporate entity to avoid income tax disappears. All retailers are subject to the tax whether they are C corporations or not. Furthermore, the tax applies to the gross receipts instead of the profit; therefore, there are no deductions for costs. The solutions from both firms' problems are: $W_H^{GRT} = \frac{1}{2}[\frac{(1-t^{GRT})^2 + c^{up}}{1-t^{GRT}} - c_H]$ and $P^{GRT} = \frac{1}{4}[3 + \frac{c^{up}}{(1-t^{GRT})^2} + \frac{c_H}{1-t^{GRT}}]$.¹⁹ The

¹⁶Both C corporations and S corporations have capital market access; however, an S corporation may have no more than 100 shareholders and only one class of common stock, and in exchange, it delivers its owners from all corporate-level taxation. The steady rise in the importance of S corporations indicates that the choice of organizational form is responsive to taxation, at least among smaller companies (Auerbach, 2006).

¹⁷The use of the S corporation is just an example of non-taxable entities. In reality, some states may tax S corporations. To the extent that more restrictions may apply to S corporations than partnerships, or sole proprietorships, the latter entities might be better examples in some cases.

¹⁸ $q_H^{CIT} = \frac{1}{4}(1 - c^{up} - c_H)$.

¹⁹Correspondingly, $q_H^{GRT} = \frac{1}{4}[1 - \frac{c^{up}}{(1-t^{GRT})^2} - \frac{c_H}{1-t^{GRT}}]$.

non-corporate retailer's after-tax profit under a CIT equals $(q_H^{CIT})^2$ (not subject to tax), while its after-tax profit under a GRT equals $(1 - t^{GRT})(q_H^{GRT})^2$.²⁰ It is straightforward to show that $q_H^{GRT} < q_H^{CIT}$, and given $1 - t^{GRT} < 1$ for any positive tax rate, the non-corporate retailer's net profit decreases under a GRT compared with the situation under a CIT. An interesting question would be whether there exists an incentive for the non-corporate retailer to become a C-corporate retailer under a GRT. If so, how would it affect the consumers and producers?

Proposition 3 *If the home state switches to a GRT from a CIT, there is an incentive for the non-corporate retailer to become a C corporation. Furthermore, the price of the final good under a GRT is lower than the price under a CIT as long as $c_H - c_L > \frac{t^{GRT}}{1-t^{GRT}} [c_L + \frac{c^{up}(2-t^{GRT})}{1-t^{GRT}}]$.*

Proof Given that a C corporation has a non-tax benefit (lower marginal cost) and there is no cost deduction under a GRT, intuitively, the S-corporate retailer has an incentive to switch back to a C corporation. If the S-corporate retailer becomes a C corporation, it would lower the marginal cost to c_L . Solving the maximization problems for both upstream and downstream firms yields the retailer's after-tax profit after switching, $(1 - t^{GRT})q^2$ where $q = \frac{1}{4}[1 - \frac{c^{up}}{(1-t^{GRT})^2} - \frac{c_L}{1-t^{GRT}}]$. Given $c_L < c_H$, then $q > q_H^{GRT}$. This implies $(1 - t^{GRT})q^2 > (1 - t^{GRT})(q_H^{GRT})^2$; thus, the non-corporate retailer would have the incentive to become a C corporation under the GRT. In this case, the price of the final good when the S-corporate retailer becomes a C corporation is $P_{switch}^{GRT} = \frac{1}{4}[3 + \frac{c^{up}}{(1-t^{GRT})^2} + \frac{c_L}{1-t^{GRT}}]$.

An interesting result is the price effect after correcting the distortion on organizational form. To see why the price of the final good could be even lower under a GRT, I compare the price after a switch under the GRT with the price under

²⁰The retailer's after-tax profit under a GRT = $\frac{1}{16} \frac{[(1-t^{GRT})^2 - c^{up} - (1-t^{GRT})c_H]^2}{(1-t^{GRT})^3} = (1 - t^{GRT})(q_H^{GRT})^2$. See footnote 19 for the expression for q_H^{GRT} .

a CIT. That is, $P_{switch}^{GRT} - P^{CIT} = \frac{1}{4} \left[\frac{c^{up}}{(1-t^{GRT})^2} + \frac{c_L}{1-t^{GRT}} - c^{up} - c_H \right]$. Rearrange to get

$$P_{switch}^{GRT} - P^{CIT} = \frac{1}{4} \left[\frac{c_L t^{GRT}}{1-t^{GRT}} + \frac{c^{up}(1-(1-t^{GRT})^2)}{(1-t^{GRT})^2} - (c_H - c_L) \right].$$

Notice that this expression is monotonically decreasing in the difference between c_H and c_L . When $t^{GRT} = 0$,

$$P_{switch}^{GRT} - P^{CIT} = \frac{1}{4}(c_L - c_H) < 0.$$

Therefore, for certain values of c^{up} , c_L and c_H such that $c_H - c_L > \frac{t^{GRT}}{1-t^{GRT}} \left[c_L + \frac{c^{up}(2-t^{GRT})}{1-t^{GRT}} \right]$, P_{switch}^{GRT} is less than P^{CIT} . This implies an increase in consumer surplus under the GRT. The result contradicts the conventional wisdom that GRTs always lead to a higher price of the final good. ■

The analysis above ignores personal income taxes and it is more consistent with situations for relatively large companies since personal income taxes are less of a concern for them. One can think of it as an extreme case where corporate profits are distributed to shareholders as dividends and assume they are taxed at the same tax rates as normal earnings.²¹ Nevertheless, the analysis might not fit well for small business. For most small businesses, personal income taxation will be an important factor when deciding the organizational form. To account for small businesses, the following combines considerations of personal income taxes and corporate income taxes at both state and federal levels to examine the organizational choices faced by small businesses. Let t_c^f, t_c^s denote the federal and state corporate income tax rates, respectively; t_p^f, t_p^s denote the federal and state personal income tax rates. In addition, the analysis considers two cases in which the profit is retained by a C-corporate retailer in the first case and distributed to its shareholders in the second.²²

Case 1: Profit is retained by a C-corporate retailer.

²¹In reality, dividends are taxed at a lower rate; however, the assumption of same rates would not change the nature of the problem although thresholds for the conditions will change.

²²For corporations, profits can be retained; therefore, in the short run, personal income taxes won't be an issue in the first case.

With a CIT, a C-corporate retailer solves the following problem:

$$\underset{q_L}{Max} (1 - t_c^f)(1 - t_c^s)[(1 - q_L)q_L - (W_L + c_L)q_L]. \quad (1.3)$$

A non-corporate retailer solves the following problem:

$$\underset{q_H}{Max} (1 - t_p^f)(1 - t_p^s)[(1 - q_H)q_H - (W_H + c_H)q_H]. \quad (1.4)$$

Results from retailer's problems would remain the same as those from profit maximization under a CIT. The downstream retailer would choose to be a non-corporate entity as long as the combined personal income tax rate ($t_p^f + t_p^s - t_p^f t_p^s$) is less than the combined corporate income tax rate ($t_c^f + t_c^s - t_c^f t_c^s$), and the non-tax benefit of incorporation (a lower marginal cost) is not sufficient to compensate the tax disadvantage of incorporation.

When the home state replaces a CIT with a GRT, retailers of both types have to pay a GRT. In addition, a C-corporate retailer still has to pay a federal CIT. Hereafter, the following notation will be used to simplify the expression: $R_i = (1 - q_i)q_i$ and $C_i = (W_i + c_i)q_i$.

A C-corp retailer's problem is as follows:

$$\underset{q_L}{Max} (1 - t^{GRT})R_L - C_L - t_c^f(R_L - C_L). \quad (1.5)$$

A non-corp retailer solves the following:

$$\underset{q_H}{Max} (1 - t^{GRT})R_H - C_H - (t_p^f + t_p^s - t_p^f t_p^s)(R_H - C_H). \quad (1.6)$$

With a GRT, the non-corporate retailer would have the incentive to become a corporation if $t_c^f < t_p^f + t_p^s - t_p^f t_p^s$. In addition, incorporation brings down the marginal cost from c_H to c_L ; therefore, the tax rate differential does not need to be extremely high to support the incentive to incorporate under a GRT. Without solving the problems, it is easy to find that the first order conditions for optimization

problems above indicate the demand for the input decreases and it becomes flatter. The intuition is that a GRT lowers the effective marginal revenue for retailers, which makes the demand for the input more elastic; thus, the upstream firm is forced to charge a lower price to induce retailers to buy more than they would otherwise. Profits would be shifted from the upstream firm to the downstream firm as long as the GRT tax rate is sufficiently low. Propositions 2 and 3 would still hold, however, the threshold to support it would differ from the previous case.

Case 2: Profit is distributed to shareholders by a C-corporate retailer.

In this case, personal income taxes are considered by retailers of both types.

With a CIT, a C-corporate retailer solves the following:

$$\underset{q_L}{Max} [(1 - t_c^f)(1 - t_c^s) - t_p^f - t_p^s + t_p^f t_p^s](R_L - C_L). \quad (1.7)$$

While a non-corporate retailer solves the same problem as in (1.4).

From the objective functions above, it is apparent that a CIT would cause double taxation. For small businesses, pass-through entities would be preferred if the tax disadvantage of incorporation is greater than the non-tax benefit (lower marginal cost).

With a GRT, a C-corporate retailer's objective function becomes:

$$\underset{q_L}{Max} (1 - t^{GRT})R_L - C_L - (t_c^f + t_p^f + t_p^s - t_p^f t_p^s)(R_L - C_L). \quad (1.8)$$

While a non-corporate retailer's objective function remains the same as in (1.6).

Comparing the objective functions above, one can see that a state GRT reduces the tax incentive to distort the organizational form since both retailers are subject to the same state GRT. The federal corporate income tax still drives a difference in tax treatments between two types of entities. However, given that incorporation enables firms to enjoy lower marginal costs, which results in greater quantity produced, the

profit increases if the non-corporate retailer becomes a corporation.²³ If the non-tax benefits exceed the tax disadvantage of incorporation, non-corporate retailer would like to become a corporation. In general, small business firms would face the similar tradeoff between non-tax benefits of incorporation and tax disadvantages of incorporation that relatively large firms would face, and the analysis above would still be valid although the conditions would change accordingly.

In summary, this section looks at a situation where the home state enacts a GRT to replace the original CIT and finds that by switching to a GRT from a CIT, the home state can reduce the distortion on the choice of organizational form under a CIT. Consequently, consumers might even benefit from a decrease in the price of the final good.

1.6 Incentives to Invest in Cost-Saving Innovation

Unlike CITs, standard GRTs impose taxes on the gross receipts; therefore, there is no deduction for costs under GRTs. From the perspective of tax administration, state governments would favor the significant reduction in the administration cost. However, tax economists argue that no deduction for costs places a heavy burden on firms with lower margins (Mikesell, 2007a; McLure, 2005). Reducing costs would be very important for these firms. In addition, from a firm's perspective, a dollar saved in cost under a GRT is a dollar gained while a dollar saved under a CIT partly goes to the tax revenue. It would be interesting to examine whether GRTs create a greater incentive for cost-saving innovation than CITs.

Reconsider the baseline model where the upstream monopoly firm produces an intermediate good and sells to a downstream monopoly firm. All assumptions remain the same except that the upstream firm can now invest in R&D to reduce its marginal cost to $c(R)$, where R is the money spent on the innovation process, $c(0) = c^{up}$, $c'(R) < 0$ and $c''(R) > 0$. Assume the upstream firm makes the innovation investment

²³Earlier discussion shows that profits for retailers are monotonically increasing in quantity.

choice before determining the price of the intermediate good.²⁴ The focus now is on the incentive to invest in cost-saving technology; therefore, I examine the case where the downstream firm will buy the good from the upstream firm under both tax systems and analyze the differential incentives to invest in R&D.

With a CIT at a rate t , the downstream firm solves the same problem as in (1.1). The solution for the problem is $q^{CIT} = \frac{1-W}{2}$. The upstream firm maximizes the profit given R determined in the innovation stage. The problem is very similar to (1.2), except replacing c^{up} with $c(R)$. Back to the innovation stage, the upstream firm chooses R to maximize its net profit:

$$\underset{R}{Max} (1-t)[(W^{CIT} - c(R))q^{CIT} - R]. \quad (1.9)$$

where W^{CIT} is the solution from the input price setting stage.

Manipulating the first order condition yields the following:

$$[c(R^{CIT}) - 1] \frac{c'(R^{CIT})}{4} = 1. \quad (1.10)$$

where R^{CIT} is the level of investment that the upstream firm chooses under a CIT.

With a GRT at the same rate, the last two stages' problems are essentially the same as previously discussed GRT cases, given R . The upstream firm determines R by solving $\underset{R}{Max} [(1-t)W^{GRT} - c(R)]q^{GRT} - R$. The level of the investment under a GRT is implicitly determined by the following equation:

$$[c(R^{GRT}) - (1-t)^2] \frac{c'(R^{GRT})}{4(1-t)^2} = 1. \quad (1.11)$$

Proposition 4 *GRTs create less incentive for cost-saving innovation than CITs do.*

²⁴In most cases, firms make innovation decisions ahead of time because it may take a relatively long time to improve the technology.

Proof Comparing equation (1.10) and (1.11), it is easy to see that they are the same when $t = 0$. The left-hand sides of both equations are the marginal benefits of innovation under each tax regime. Let MB^{CIT} and MB^{GRT} denote the left hand sides of equation (1.10) and (1.11), respectively. Comparing the two marginal benefits of innovation investment when holding the investment level R the same in both cases yields:

$$MB^{CIT} - MB^{GRT} = c(R)\frac{c'(R)}{4} - c(R)\frac{c'(R)}{4(1-t)^2} = c(R)\frac{c'(R)}{4}\left[1 - \frac{1}{(1-t)^2}\right].$$

Given that $c'(R) < 0$ and $t > 0$, $MB^{CIT} - MB^{GRT} > 0$. The marginal benefit of innovation is higher under a CIT than under a GRT, which implies that firms will have greater incentive to invest in cost-saving innovation under a CIT.²⁵ ■

The intuition behind this result is that a GRT reduces firms' effective marginal benefit of innovation while a CIT reduces the gross marginal benefit and marginal cost at the same time, leaving the effective marginal benefit unchanged. To sum up, a GRT does not lead to a greater incentive for firms to invest in cost-saving innovation compared with the situation under a CIT.

Although not presented here, differential incentives to innovate for the downstream firm can also be investigated. In this case, the downstream firm incurs a marginal cost of processing the intermediate good into the final good, which can be reduced by innovation investment. The timing is still that the innovation decision is made before firms making price decisions. Similar to the above analysis, comparing the marginal benefits of innovation under both tax systems shows that there is less incentive for innovation under a GRT.

1.7 The Impact of Market Structure

The above analyses assume both upstream and downstream firms are monopolies. However, the real world involves various market structures that may significantly differ from each other. One may wonder whether the results still hold in other

²⁵The result is valid for any positive tax rate, including the revenue neutral tax rate.

market structures. Intuitively, market structures might influence previous results in the following ways. First and foremost, markets can differ significantly in the degrees of competition. In general, competition in the market impacts firms' ability to charge a higher price; therefore, the incentive underlying the vertical integration and profit shifting results are potentially affected. Furthermore, various combinations of upstream and downstream market structures result in different distributions of market power between the upstream and the downstream firms. These potentially influence how the input price is set.

To examine the impact of market structure on previous results, the downstream market is altered to increase the degree of competition in the market. Suppose there are n downstream firms competing on quantity. The upstream firm is a monopoly. Using backward induction, the downstream firms play a standard Cournot game, each taking other firms' quantity and the input price as given. Assume a symmetric equilibrium exists, summing up the Cournot equilibrium quantities of all downstream firms gives the market demand for the input. Substituting the market demand into the upstream firm's problem under each tax system yields the solutions under each tax regime: $W^{CIT} = \frac{1+c^{up}}{2}$, $P^{CIT} = \frac{2+n(1+c^{up})}{2(n+1)}$; $W^{GRT} = \frac{1-t}{2} + \frac{c^{up}}{2(1-t)}$, $P^{GRT} = \frac{2+n}{2(n+1)} + \frac{nc^{up}}{2(1-t)^2(n+1)}$.²⁶ The solutions indicate that as the number of downstream firms increases, the price of the final goods (P) decreases under both tax regimes with a higher price under a GRT.²⁷ This is consistent with the notion that competition drives down the price. What is interesting is that the price of the input (W) under each tax regime does not change as the number of firms increases in the downstream market. A careful look into the first order condition from a downstream firm's problem reveals that as the number of firms increases, the market demand for the input, deriving from this first order condition, is simply a multiple of the demand in the baseline model. Accordingly, the objective function for the upstream firm is also a multiple of the one in the baseline model, which suggests the input price remain the same. The

²⁶Derivation of the solutions is shown in Appendix A.

²⁷ $\frac{\partial P^{CIT}}{\partial n} = -\frac{(1-c)}{2(1+n)^2} < 0$, $\frac{\partial P^{GRT}}{\partial n} = \frac{-1}{n+1} \cdot \frac{1-t-\frac{c}{1-t}}{2(1-t)(n+1)} < 0$ given previous assumptions hold.

discussion above implies that Lemma 1 still holds, meaning the vertical integration discussion is still valid. A further look at the difference in the profit per unit for the downstream firm ($P - W$) under both tax regimes would allow one to examine the profit shifting possibility. As n increases, the difference between $(P^{GRT} - W^{GRT})$ and $(P^{CIT} - W^{CIT})$ increases, which implies that the profit per unit increases when the home state enacts a GRT to replace the CIT in a more competitive downstream market.²⁸ However, the quantity difference ($Q^{GRT} - Q^{CIT} < 0$) decreases, indicating that the reduction in quantity due to a switch to a GRT is greater as n increases. Therefore, the profit shifting result holds only if the percentage increase in the profit per unit is greater than the percentage decrease in the quantity.

The general finding from this exercise is that as the number of downstream firms increases, the price difference in the intermediate good between two tax systems increases. This suggests that the incentive for vertical integration argument becomes stronger. In addition, the profit shifting result is still applicable as long as the per unit profit increase is sufficient. Arguments on organizational form and the incentive to innovate are less influenced by the degree of competition in the market since the former relies on GRTs' tax neutrality on organizational form and the cost benefit to incorporation, while the latter comes from the fact that GRTs reduce the effective marginal benefit of innovation compared to CITs. To sum up, previous analyses are still applicable within confines of the models when the downstream market structure changes.

1.8 Influence of Bargaining Power

In addition to impacts of varying market structures, the analysis above does not allow the upstream and downstream firms to bargain with each other for the price of the intermediate good. When the upstream monopolist posts a price, it offers a take-it-or-leave-it opportunity to the downstream sellers. Therefore, previous analysis

²⁸See Appendix A for the proof.

inherently assumes the upstream firm has all of the bargaining power. Despite this a GRT still leads to a lower price for the intermediate good compared to a CIT case. It would be interesting to see what happens as the downstream firm gains more bargaining power. Would the reduction in the price of the intermediate good after home state's switching to a GRT be greater when the downstream firm has all of the bargaining power? In this section, the upstream and downstream firms play a slightly different game, which allows an examination of the influence of bargaining power on firms' behavior. In particular, it explores how different distributions of bargaining power among the upstream and downstream firms impact the results.

Suppose the upstream and downstream firms play a Nash bargaining game at the beginning. They bargain over the price that the upstream firm charges the downstream firm. Then the downstream firm decides how much to produce, and thus, the price of the final good. Let b ($b \leq 1$) indicate the bargaining power for the upstream firm and $1 - b$ for the downstream firm. The market structure and the associated cost structure are the same as in the baseline model .

With a CIT, the downstream firm maximizes the profit given the bargained price of the intermediate good. The problem looks exactly like (1.1) in Section 2. What differs is the first-stage game that the two firms can bargain over W . The Nash bargaining game is the following:

$$Max_W (1 - t)[(W - c^{up})q^{CIT}]^b[(1 - q^{CIT})q^{CIT} - Wq^{CIT}]^{1-b}. \quad (1.12)$$

Solving the game yields $W^{CIT} = \frac{1}{2}(b - bc^{up} + 2c^{up})$. Consequently, the price of the final good is $P^{CIT} = \frac{1}{4}(2 + b - bc^{up} + 2c^{up})$.

With a GRT, the downstream firm maximizes the after-tax profit, which yields q^{GRT} as in Section 3. Back to the bargaining stage, firms maximize the product of after-tax profits for both firms:

$$Max_W [(1 - t^{GRT})Wq^{GRT} - c^{up}q^{GRT}]^b [(1 - t^{GRT})(1 - q^{GRT})q^{GRT} - Wq^{GRT}]^{1-b}. \quad (1.13)$$

The solution is $W^{GRT} = \frac{b(1-t^{GRT})^2 - bc^{up} + 2c^{up}}{2(1-t^{GRT})}$. Accordingly, the downstream firm sets the price, $P^{GRT} = \frac{2(1-t^{GRT})^2 + b(1-t^{GRT})^2 - bc^{up} + 2c^{up}}{4(1-t^{GRT})^2}$.

Proposition 5 *More bargaining power in the upstream firm leads to a greater reduction in the price of the intermediate good when replacing the CIT with a GRT. However, if the bargaining power is completely shifted to the downstream firm, the price of the intermediate good is higher under a GRT.*

Proof Comparing the results under both tax systems yields the following: $\frac{\partial(W^{CIT} - W^{GRT})}{\partial b} = \frac{1}{2}[t^{GRT} - c^{up} + \frac{c^{up}}{1-t^{GRT}}] = \frac{1}{2}[t^{GRT} + c^{up}(\frac{1}{1-t^{GRT}} - 1)] > 0$. This means that the more bargaining power the upstream firm has, the more reduction in the price of the intermediate good when the home state replaces the CIT with a GRT.²⁹ When $b = 1$, the upstream firm having all of the bargaining power, the objective functions under both tax systems are the same as those in Section 2 and 3; thus, the results coincide. When $b = 0$, $W^{CIT} = c < W^{GRT} = \frac{c}{(1-t^{GRT})}$ for any positive tax rate: this implies that if the downstream firm has all of the bargaining power, different from the previous finding, the price of the intermediate good is now higher under a GRT. The intuition here is that the upstream firm is forced to charge the lowest price since it has no say in the game, that is, it charges the marginal cost of production. Furthermore, a GRT drives up the effective marginal cost while a CIT does not due to cost deduction; therefore, the price of the intermediate good is higher under a GRT than under a CIT. Consequently, previous profit shifting and vertical integration arguments disappear in this extreme case. ■

A careful look into the distribution of bargaining power also provides some insights about the relative competition in the upstream and downstream market. One can

²⁹As long as $t^{GRT} < 1 - \frac{c^{up}(2-b)}{b}$, $W^{CIT} > W^{GRT}$.

make the connection that more bargaining power in the downstream firms corresponds to a relatively more competitive upstream market. The intuition is that a more competitive upstream market indicates that the downstream firms have more choices when making their input decisions; thus, less bargaining power for any upstream firm. Similarly, more bargaining power in the upstream firm reflects relatively more competition in the downstream market. The discussion just offers an alternative way to look at the effect of varying both market structures. Specifically, as b increases, more bargaining power in the upstream firm can be considered analogous to relatively more competition in the downstream market. As discussed in the previous section, it would result in a greater reduction in the price of the intermediate good. This suggests that if the quantity decrease is not significant, the profit flows more to the downstream when the state where the downstream is located replaces a CIT with a GRT. On the other hand, the upstream becomes more competitive and the downstream becomes relatively less competitive as b decreases, and the gain from the reduction in the intermediate good price would be smaller when the home state enacts a GRT to replace the CIT. The incentives for vertical integration and profit shifting arguments become weaker and the domain for the support shrinks.

1.9 Conclusion

Understanding the incentives and impacts of GRTs is an important task for tax economists and policy makers. The conventional wisdom is overwhelmed by the notion that GRTs are really poor tax instruments. However, since we are not living in the first-best world, the appropriate analysis should examine the relative advantages and disadvantages of GRTs over feasible alternatives. The comparative performance of GRTs may not be as bad as the perception of their absolute performance.

This paper uses a basic model with different extensions to explore the various incentives and effects of GRTs versus CITs. The model is exploited to investigate the incentive for vertical integration in the sense of make-or-buy decisions, the effect on

the profit distribution between the out-of-state firm and in-state downstream firms, the incentive to change organizational form for tax purposes, and the incentive for cost-saving innovation.

I find several interesting results. First, if firms prefer making their own inputs to buying from the upstream firm under a GRT, they would also do so under a CIT. However, there exist situations in which firms would prefer buying the inputs under a GRT but making their own inputs under a CIT depending on the relative cost of buying versus making under different scenarios. This overturns the conventional wisdom, with GRTs providing less incentives for vertical integration. Second, the home state can shift profits from upstream, out-of-state firms to downstream, in-state firms by replacing a CIT with a GRT. Third, a GRT helps eliminate the incentive to change organizational forms for tax purposes, and consequently it can result in even lower prices of the final goods. Finally, a GRT creates less incentive for cost-saving innovation than a CIT does.

This paper is the first to provide a careful theoretical analysis investigating the impacts of GRTs in an equilibrium framework. It seeks to use simple models that can exemplify the nature of the problem, followed by robustness checks to verify the validity of the results. But the real world is more complicated than the constructed models. In addition to those discussed in the paper, there are several other aspects worth further examination. First of all, it would be interesting to incorporate tax planning of multistate companies into the model and see how the nature of the problem evolves. Moreover, this analysis could be extended to look at a new dimension of state tax competition, that is, states compete with each other by replacing the old tax instrument with a new one. Of course, this would complicate the models and they may not be solvable. Furthermore, it would be useful to perform welfare analysis under the two systems. Last but not least, it is very important to find empirical evidence to support the predicted results from the models. With more states considering some form of GRTs, it would be worthwhile to collect the data and test the theoretical predictions. To conclude, perceptions about GRTs are not

necessarily true and further research on the effects of GRTs is necessary to help understand these taxes before making any policy suggestion.

Chapter 2

Reconsidering Gross Receipts Taxes: An Empirical Study

2.1 Introduction

With the continuing decline in corporate income tax revenue and the distortions on investment and location choices associated with corporate income taxes (CITs), states have been actively looking for alternative ways to tax businesses.³⁰ Despite heavy criticism, a significant and perhaps surprising movement since 2002 has been the resurgence of gross receipts taxes (GRTs).³¹ Five states, Kentucky, Michigan, New Jersey, Ohio, and Texas, levied certain forms of GRT by 2008, and five other states, California, Illinois, Maine, Montana, and Rhode Island, have considered modified GRTs.³² In 2010, Oklahoma levied a variant of GRT. As more states enact GRTs or some variants of GRTs, it is important to find evidence of the effects of GRTs on

³⁰The revenue from the federal CIT dropped from between 5 and 6 percent of GDP in the early 1950s to 2.1 percent of GDP in 2008. See details at <http://www.taxpolicycenter.org/briefing-book/background/numbers/revenue.cfm>.

³¹States have also considered net receipts taxes. The California Commission on the 21st Century Economy recently proposed a Business Net Receipts Tax. In general, GRTs do not allow deductions for input costs, but net receipts taxes allow deduction for non-labor inputs.

³²Kentucky and New Jersey used gross receipts as an alternative minimum in their corporate income tax structure.

the economy. Nevertheless, the effects of imposing GRTs as replacements for existing taxes have never been examined empirically.

There is little empirical literature on GRTs, although GRTs have been heavily criticized in the past. The main criticism comes from the fact that a GRT taxes gross revenues at each stage of the production process, creating multiple layers of taxation along the supply chain, a phenomenon called tax pyramiding. Because of this tax pyramiding, conventional wisdom claims that GRTs create an incentive for firms to vertically integrate to reduce tax liabilities. However, the previous essay argues that the reverse could be true with less vertical integration under a GRT but more vertical integration under a CIT. Several results from the theoretical analysis raise caution about the traditional views on the effects of GRTs.

States may impose GRTs for different reasons, either politically or economically. One general argument supporting GRTs is that they broaden the tax base; thus, allowing for reductions in the tax rate. A CIT only taxes corporations with positive profits.³³ According to 2007 Integrated Business Data, corporations on average account for 19.7% of total businesses.³⁴ The GRT base is much broader because it taxes all businesses, allowing for a lower tax rate.³⁵ Another argument is that GRTs eliminate the incentive to distort the choice of organizational form (Goolsbee, 2004; Luna and Murray, 2010). Unlike a CIT, a GRT generally applies to all business entities, including C corporations, S corporations, limited liability companies, partnerships, and sole proprietorships. Therefore, the tax incentive to be a non-corporate enterprise that arises under a CIT disappears. In general, GRTs can reduce tax planning related to business structures, definitions of profits, and situsing of economic activity.

Focusing on the latter argument, this paper is the first to empirically test the effect of GRTs on the distribution of firms by organizational form. Data from nonemployer

³³Some states tax limited liability companies.

³⁴For more details, see <http://www.irs.gov/pub/irs-soi/07ot3naics.xls>.

³⁵GRTs also broaden the tax base by taxing gross revenues instead of profits; however, the effective tax rate is not necessarily lower due to tax pyramiding.

firms, accounting for more than 70% of total businesses, are used in the analysis. Using two measures of the corporate share, the corporate share of total nonemployer firms and of total nonemployer receipts, the results show that states with a GRT have a higher share of corporate firms. This suggests that GRTs reduce the distortion on the choice of organizational form and firms are more willing to be C corporations to enjoy the non-tax benefits of incorporation. Furthermore, the results using the corporate share of total receipts indicate that the share of real activity of corporations increases after replacing a CIT with a GRT, which may imply that CITs induce a significant reduction in the real activity of C corporations in terms of sales. By replacing the CIT with a GRT, states may promote the real activity done by C corporation.³⁶

The remainder of this paper is organized as follows. Section 2 provides a brief background on the choice of organizational form under a CIT. Section 3 reviews the literature on the choice of organizational form. Section 4 introduces the theoretical background and identifies the testable hypotheses based on the theory. Section 5 develops the empirical model followed by data description in Section 6. Section 7 discusses the results. Section 8 offers a brief conclusion with a discussion of limitations and possible future research.

2.2 Institutional Background

Firms may choose between corporate and non-corporate structure based on tax and non-tax factors. On the tax side, income earned by firms is taxed under the corporate income tax and again under the personal income tax when the profit is distributed to the shareholders, leading to double taxation. If instead the firm chooses to be a non-corporate entity, such as an S corporation or other pass-through entity, the income is only subject to the personal income tax for each owner of the firm. Earnings from pass-through entities flow to their owners and are taxed only once on the owners'

³⁶The analysis does not suggest that the total activity necessarily rises.

personal income tax returns; thereby avoiding double taxation. A corporate firm, however, can choose to retain profits within the firm. Retaining earnings is a way to shift income from personal tax base to corporate tax base.³⁷ Considering a closely-held corporation, it is fairly easy to retain profits within the firm. This implies more corporate taxable income and less personal taxable income, although it might incur larger realized capital gains when and if the firm is sold. Upon sale of the firm, the gains are taxed at a lower capital gains rate. Consequently, the incentive to choose one form of organization versus the other depends partially on the differential tax rate between corporate and personal income taxes.³⁸

When personal income tax rates drop relative to corporate tax rates, it becomes more attractive for any firm with positive income to shift from corporate to non-corporate status.³⁹ The Tax Reform Act of 1986, which significantly decreased personal income tax rates, provides a natural experiment for examination of this argument. MacKie-Mason and Gordon (1997) show that non-corporate activity significantly increased following the tax reform. In general, the incentives for firms to choose a specific organizational form depend on the particular tax rates faced by the owners of each firm. For example, some firm owners may have marginal personal tax rates that are higher than the corporate rate, while others will have lower personal tax rates. Firms with positive profits would benefit from choosing a non-corporate form when they are owned by individuals facing personal rates below the corporate rate. When the relative taxation of corporate income rises, shifting to the non-corporate sector should be concentrated among firms with positive taxable income.

³⁷See detailed discussions in Section 5 of Essay 1.

³⁸As Goolsbee (2004) shows, a simple model can be used to illustrate a firm's decision about whether to incorporate. Denote the revenue generated by a firm as R and non-tax benefits of incorporation as B which depends on firm characteristics, x . Let t_{nc}^f, t_{nc}^s be the federal and state personal income tax rates facing non-corporate firms, respectively; t_c^f, t_c^s be the federal and state corporate income tax rates; t^e be the tax rate on equity income. A noncorporate firm gets no B but pays only personal income taxes on the income and assume a firm of either type is capable of raising the same revenue. A firm would prefer the noncorporate form when $B(x) < R(\tilde{t}_c - (1 - \tilde{t}_c)t^e - t_{nc})$ where $\tilde{t}_i = t_i^f + t_i^s - t_i^f t_i^s$, $i = \{c, nc\}$.

³⁹Owners of corporations can also shift profits through wage payouts to themselves to shift income between the corporate and personal tax base.

Corporations offer two major non-tax benefits. First, it is much easier for incorporated businesses to raise capital compared to businesses with other legal structures, mainly because they can raise money by selling shares to shareholders.⁴⁰ Issuance of equity dilutes ownership but share capital does not have to be paid back, nor does it incur interest. For many small business owners, this is a great benefit to business incorporation. Second, corporations have limited liability. Flow-through entities generally do not have limited liability except for limited liability companies (LLCs) and limited liability partnerships (LLPs). This feature of incorporation significantly reduces the risk involved with running a business, though other firms could purchase insurance against such risk. In addition, the risk involved with becoming an entrepreneur falls on the shareholders, but they only carry the amount equal to the percentage they have invested.⁴¹ Sole proprietorships and partnerships are personally responsible for any downfalls the business may take. In general, easy access to capital market and limited liabilities are the two major non-tax factors influencing a firm's incorporation choice (Goolsbee, 2004).

2.3 Literature on the Choice of Organizational Form

Although there is little literature on the effects of GRTs on organizational form choice, there is much richer literature on the choice of organizational form under CITs. As discussed above, a CIT generates a distortion by taxing corporate income at a differential rate compared with income earned in non-corporate form. In general, corporations pay tax on income earned at the corporate level and then shareholders pay taxes either on capital gains or dividends. In fact, the taxation

⁴⁰During a recent hearing held by the Senate Finance Committee on March 8, 2011, Michael Graetz of the Columbia Law School argued that under the current rules it would be foolish for a large firm that can raise capital privately to organize as a corporation, which in turn implies corporations have easier access to capital market.

⁴¹Personal property could be taken to pay off business debts with an incorporated business if the shareholder used his own assets as a guarantee against the businesses' debts.

of corporate income generally exceeds that of personal income. This raises the question of how distortionary the CIT is in practice. The conventional assumption embedded in standard work by Harberger (1966) and Shoven (1976) is that non-tax factors dominate in the decision on organizational form, so that certain industries are necessarily corporate and others non-corporate. They use general equilibrium models, and the results tend to suggest relatively small efficiency costs from corporate taxation because activity does not easily shift between sectors. Later studies relax this assumption and investigate firms' choice of organizational form in response to tax incentives. This would indicate larger efficiency costs under CITs.

Gravelle and Kotlikoff (1988, 1989, 1993) argue that CITs can lead to large amounts of shifting between corporate and non-corporate status if firms of both types produce in the same industry. Further, the deadweight loss (DWL) from the CIT is very large. The DWL in their models is driven by how much firms in the same industry shift to non-corporate forms due to the CIT. Gordon and Mackie-Mason (1990, 1994, 1997) focus on the extent to which an increase in the CIT rate induces firms to shift out of corporate form as an important way to examine the distortion created by the CIT. They show that noncorporate activity tends to be concentrated in industries where non-tax costs are small, leading to little excess burden from the tax distortion on organizational form. Luna and Murray (2010) show that the large variation in corporation versus partnership filings across the states can be partially attributed to state tax policy. These studies differ in data and model specifications. However, the earlier empirical work has generally found no evidence that real economic activity shifts out of corporate form in response to tax changes except in special cases.

Goolsbee (2004) uses new data compiled in the Census of Retail Trade to investigate the problem. His results based on cross-sectional data suggest that the share of real economic activity performed by corporations responds to changes in the relative taxation of corporate to personal income. Further, the response is many times larger than that found in previous literature based on time-series data. However, the results show little impact on the actual operations of firms in terms of labor intensity,

wages and the like. In addition, the results indicate that firms may exploit the progressivity of the CIT system by breaking into numerous small firms as a means of avoiding moving into higher income brackets.

To sum up, previous studies find that CITs' differential tax treatments on corporate and non-corporate income distort firms' organizational form choice; however, less evidence is found on distortions in real economic activity. The GRT is imposed on all businesses regardless of whether firms are corporate or non-corporate. Therefore, GRTs would not be expected to distort organizational form choice. This paper adds to the current literature by showing that replacing the CIT with a GRT may correct the distortion on the choice of organizational form. In addition, it also provides evidence that imposing a broad-based tax could increase the real economic activity of corporations, which may suggest that a CIT causes losses in real economic activity due to the distortion.

2.4 Theoretical Background

As discussed above, a firm can be organized as a non-corporate entity to avoid double taxation and differential taxes on types of income under a CIT, but at the expense of non-tax benefits of incorporation. In Essay 1, I show that if the home state replaces the CIT with a GRT, there is an incentive for the non-corporate retailer to become a C corporation (Proposition 3). The main reason for this result is that a GRT eliminates the incentive to distort the organizational form choice and firms then prefer the corporate form to enjoy the corresponding non-tax benefit. The non-tax benefit of incorporation manifests itself in lower marginal costs in my model due to the increased access to capital markets for corporations.

In the model for small businesses from the previous essay, all that matters are the relative taxation of corporate versus personal income and the non-tax benefit of incorporation. It does not emphasize the situations for firms operating in multiple states. For a multi-state firm, total profits from all businesses conducted are

apportioned to each corresponding state using an apportionment formula. The effective tax rate then becomes a weighted average of tax rates in all associated states according to the apportionment formula. Since my sample data concentrate on small entrepreneurial firms, this model is appropriate to capture the real concern. Given that individual firm-level data are not available, it is impossible to directly investigate individual firms' organizational form choices. But from the model prediction that firms are more willing to choose the corporate structure to enjoy the non-tax benefit under a GRT than under a CIT, one can derive the following hypotheses:

Hypothesis 1: States with GRTs have a higher corporate share of total firms.

Hypothesis 2: The corporate share increases as industry capital expenditures rise.

The first hypothesis comes directly from the theoretical prediction. That is, firms in GRT states are more likely to incorporate to enjoy the non-tax benefit; thus, a greater corporate share in those states. The second hypothesis is associated with the assumption that corporations benefit from easy access to capital; therefore, the non-tax benefit of incorporation is greater for firms in industries with higher capital expenditures. If this assumption is true, one would expect that the corporate share should increase with industry capital expenditures.

2.5 Empirical Specification and Econometrics Issues

The following model is used to investigate the effects of state business taxes on the corporate share in a given state and industry:

$$C_{ijt} = \alpha + \beta G_{it} + \rho K_{jt} + \sigma' Tax_{it} + \theta' X_{ijt} + \gamma' Z_{it} + Y_t + \eta' IN_j \cdot K_{jt} + v_{ij} + \varepsilon_{ijt}.$$

The dependent variable C_{ijt} is the corporate share of total firms for state i in industry j at time t . The explanatory variables include major variables of interest, G_{it} and K_{jt} , where G_{it} indicates whether state i at time t imposes a GRT or not; K_{jt}

is the industry capital expenditure index, calculated by dividing the national capital expenses in industry j by total national capital expenditures of all industries at time t . The coefficients β and ρ correspond to the two hypotheses. Other explanatory variables include: Tax_{it} , a vector of state tax structure variables; X_{ijt} , a vector of state–industry characteristics that may influence the gains to incorporation; Z_{it} , a vector of state-level characteristics that may influence the likelihood of incorporation; ν_{ij} , a vector of state–industry fixed effect dummies; Y_t , a vector of year dummies which control for common unobservable shocks across all states; IN_j , a vector of industry dummies which only enter as interactions with the capital expenditure index; ε_{ijt} , the random error.⁴²

There are two major econometric concerns for the model. First, the GRT dummy might be endogenous. The concern is that states with fewer corporations might be unable to generate sufficient CIT revenue; therefore, they are more likely to enact a GRT as an alternative way to generate tax revenue. Two instruments are used to perform the Durbin–Wu–Hausman test for endogeneity: the dollar amount of state outstanding debts at the end of fiscal year, and a dummy variable indicating whether the majority party in the Senate is Democratic. The test result fails to reject the null hypothesis that an OLS estimator of the same equation would yield consistent estimates.⁴³ The reason may be that corporations have many ways to evade or avoid corporate taxes and more corporations do not guarantee higher tax payments, which means that the corporate share is not the major concern when states enact a GRT.

Second, the industry capital expenditure variable might be endogenous. Because it is easier for corporations to get access to capital market, more corporations may result in higher capital expenses. Therefore, the national industry capital expenditure variable is instrumented with the number of firm establishments in the industry and

⁴²The industry dummies do not enter directly since they are already in the state–industry dummies (linear combination). The purpose of adding the interactions is to see which industries have larger increases in the corporate share when capital expenditures rise.

⁴³Regression results from the estimation using those two instruments are similar to the OLS results.

the average wage and salary in the industry at the national level. The test for endogeneity of this variable rejects the null hypothesis; therefore, IV estimation is used for the analysis and both instruments are highly significant in the first stage of the IV estimation.⁴⁴ Other general concerns regarding heteroscedasticity and correlations are accounted for in the estimation.⁴⁵

2.6 Data

The best data source for the dependent variable is the legal form of organization data from the Economic Census provided by the US Census Bureau. The Census Bureau collected the data for all industries and states for 1992, 1997, 2002, and 2007, but the data are not open to the public and require special tabulations at the state level. Goolsbee (2004) used the 1992 data for the retail trade industry as the source for state data on organizational form. He explored the variation across industries (at the three-digit SIC code level) and across states, but the data for the later years are not available at this time. Instead, a dataset from Nonemployer Statistics is used. Nonemployer Statistics is an annual series of information about businesses without paid employees. According to the US Census Bureau, nonemployer firms account for more than 70 percent of all businesses in the US. Nonemployers account for a large part of the business universe in terms of the number of firms, although they contribute a relatively small portion of the overall sales and receipts. This dataset has its limitations; however, it is the only state-industry panel dataset available. There is a fair amount of variation across industries and states in terms of distribution of firms by organizational form. More importantly, multistate companies are less of a concern in this dataset, which makes it easier to test the theoretical prediction.⁴⁶ In general,

⁴⁴Tests of exogeneity for the other control variables are performed and reveal no significant evidence of endogeneity.

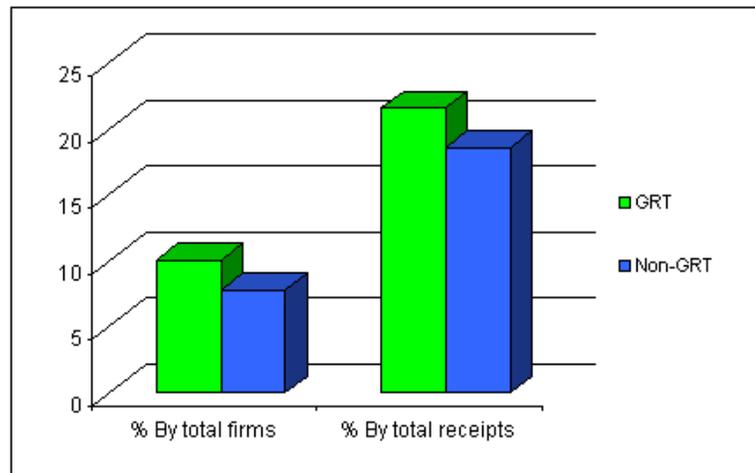
⁴⁵Cluster-robust standard errors are used to control for heteroscedasticity and correlations in the errors as suggested by Wooldridge (2002).

⁴⁶Multistate firms often have subsidiaries operating as non-corporate entities in different states and establish headquarters as corporations situated in states with no CITs. The choices for them are

if GRTs affect incorporation decision for nonemployers, one would also expect to see similar results with employers.

The panel dataset includes 48 continental states across 18 industries from 2002 to 2008. A glimpse at the summary statistics of this nonemployer dataset in Table 2.1 suggests that industries with higher capital expenditures tend to have a greater share of corporations, measured by both percentage of total nonemployer firms and percentage of total nonemployer firm receipts. This seems to be consistent with the setup in my theoretical model that corporate firms can benefit from lower marginal costs due to easy access to capital.

Further, a simple plot of the corporate shares in GRT states and non-GRT states suggests that GRT states tend to have a higher share of corporations. Figure 2.1 shows both the corporate share of total firms and of total receipts.⁴⁷



Source: Nonemployer Statistics, US Census Bureau

Figure 2.1: Corporate Shares in GRT and Non-GRT States

not just whether to incorporate or not; therefore, it would be harder to test the theoretical prediction using the sample including those multistate firms. For generality of the results, it would be nice to have the full sample including both employers and nonemployers but multistate firms would be an issue.

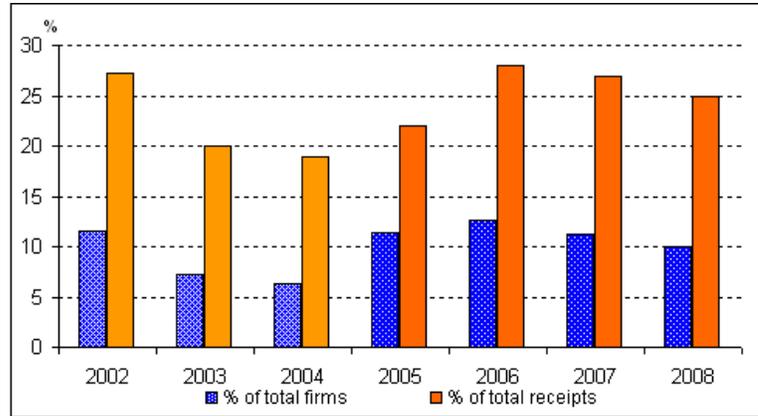
⁴⁷Figure 2.1 excludes the states that imposed GRTs recently.

Table 2.1: Capital Expenditure across Industries and Share of Firms by Organizational Form

Industry	Capital Expense(\$M)	Average # of firms	% of Firms			% of Receipts		
			Corporation	Partnership	Soleproprietorship	Corporation	Partnership	Soleproprietorship
Forestry, fishing and agriculture service	2,372	4562	5.06	3.20	91.75	13.61	8.41	77.98
Mining	149,895	2048	14.68	12.26	73.06	22.95	22.76	54.30
Utilities	98,272	339	17.51	6.08	76.41	36.39	21.11	42.50
Construction	41,690	50230	5.29	2.93	91.78	14.28	9.42	76.29
Manufacturing	211,357	6331	12.01	5.20	82.78	28.28	12.30	59.42
Wholesale trade	32,941	7915	13.96	4.85	81.19	24.73	9.00	66.27
Retail trade	73,436	38992	5.42	3.26	91.32	16.03	8.68	75.29
Transportation and warehousing	79,580	19720	6.31	2.34	91.35	13.47	5.01	81.53
Information	103,424	5953	9.18	4.87	85.95	25.57	15.51	58.92
Finance and insurance	145,352	14995	7.66	11.38	80.96	11.84	15.47	72.69
Real estate and rental	96,045	45628	13.78	37.76	48.46	17.11	59.38	23.51
Professional, technical services	32,738	57933	6.15	2.60	91.25	15.27	9.25	75.48
Administrative and support	4,561	30750	2.99	1.40	95.62	15.55	7.04	77.41
Educational services	16,546	9261	1.89	0.88	97.23	11.89	5.11	83.00
Healthcare and social assistance	27,390	34194	2.34	0.90	96.76	12.22	9.08	78.70
Arts, entertainment	90,044	20272	3.62	2.05	94.32	14.93	8.72	76.35
Accommodation and food services	17,025	5744	9.46	6.52	84.02	30.31	23.16	46.53
Other services	28,309	58216	2.97	1.62	95.41	11.81	5.99	82.19

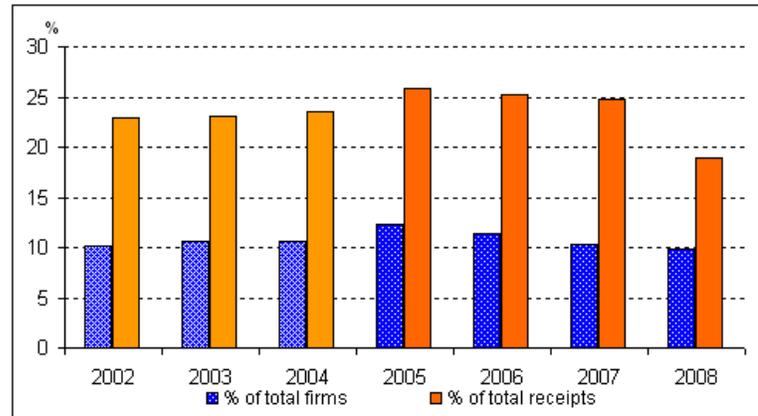
Source: Nonemployer Statistics, US Census Bureau

In addition, the data from states that enacted GRTs in recent years suggest a systematic increase in the corporate share after the implementation of GRTs. For example, as shown in Figures 2.2 and 2.3, the corporate share of total firms and the corporate share of total receipts in Ohio Manufacturing and Mining industries experienced a jump when Ohio enacted the GRT in 2005. Similar patterns were found in other industries as well.



Source: Nonemployer Statistics, US Census Bureau

Figure 2.2: Corporate Share in Ohio Mining Industry



Source: Nonemployer Statistics, US Census Bureau

Figure 2.3: Corporate Share in Ohio Manufacturing Industry

The major explanatory variables for the analysis are the dummy variable indicating whether states impose a GRT and the industry capital expenditure variable

measured by the industry share of total capital expenditures at the national level. The data for these two variables come from the Commerce Clearing House (CCH) State Tax Handbook and the US Census Bureau Annual Capital Expenditures Survey.

Tax structure variables include the top statutory corporate income tax rate and the average marginal personal tax rates on wage income, dividends, and capital gains. These variables are included to control for the relative taxation of corporate and personal income. The average marginal personal income tax rates on factor income combining federal and state taxes were computed by the NBER's TAXSIM model.⁴⁸ An additional tax consideration relates to the progressivity of state corporate income tax systems. As Luna and Murray (2010) argue, a pass-through entity can lower the tax burden by spreading them among all members with each member taxed at member rates instead of having all income taxed at the entity-level corporate rate. For this reason, progressive CITs may create higher incentives for firms to be organized as pass-through entities.⁴⁹ Thirteen states had progressive corporate rate structures in 2008. To control for this potential influence, a dummy variable indicating whether states have a progressive CIT is included.

In addition to considerations of tax structure, state-industry characteristics may also influence the probability of incorporation. Along the same lines of consideration in Goolsbee's (2004) paper, characteristics such as firm size, pay, number of establishments and the like, can affect the incorporation decision by altering the value of limited liability or access to capital markets. Therefore, I include industry total establishments, industry average annual wage and salary, and industry employment in a given state. Further, industry dummies are interacted with the industry capital expense variable to control for any industry level variation in non-tax reasons for incorporation.

⁴⁸The rates characterize differences in the state laws across states and times, without conflating changes in the distribution of income through time or differences across states. See <http://www.nber.org/~taxsim/marginal-tax-rates/>.

⁴⁹Goolsbee (2004) provides another argument that the progressive tax structure may induce companies to divide into numerous small firms.

Finally, there may be time-varying state characteristics that potentially influence the probability of incorporation in all industries. For instance, the overall business climate and education level of residents might attract more corporate firms to locate within the states. The general argument is that state economic status and demographics can influence the probability of incorporation; thus, I include state GDP, state unemployment rate, state per capita income, and percentage of population over 25 with at least a bachelor's degree.

2.7 Results

Using the nonemployer panel dataset, the results in Table 2.2 show that a GRT positively affects the corporate share of total nonemployer firms in a given state and industry.⁵⁰ This is consistent with the prediction that a GRT eliminates the distortion on the choice of organizational form arising under the CIT and firms are more willing to incorporate based on the non-tax benefits of incorporation. When a state replaces the CIT with a GRT, the corporate share of total firms in a given state and industry increases by 0.29 percentage points.⁵¹ This means that the industry average corporate share of total firms would increase by 3.7%.⁵²

Several other variables are also found to affect the incorporation decision in a given state and industry. As shown in Table 2.2, the size of the economy measured by state GDP has a positive effect on the corporate share. Furthermore, states having a greater share of population with higher education tend to have a higher corporate share. This may evidence that states with a pool of high-skill workers provide a greater incentive for corporations to locate there. Meanwhile, the results also suggest

⁵⁰New Mexico is treated as a non-GRT state in my sample because its tax works like a sales tax except that the tax is a broad-based tax. Regressions including New Mexico in the GRT states result in similar findings.

⁵¹The dependent variable is measured in percentage points. In addition, control variables enter the regression in linear form, except for a few in natural log form. The choice of the functional form is based on the plots of the data and is also consistent with those used in the previous literature.

⁵²The industry average corporate share of total firms in my sample is 7.8%. Imposing a GRT would raise the corporate share to 8.09%, which is 3.7% increase in the corporate share.

Table 2.2: Panel Regression Results on State-Industry Corporate Share by Firms

	Corporate Share of Total Firms
GRT	0.291*** (0.098)
Top CIT rate	-0.052*** (0.02)
Marginal tax rate on wage income	-0.248** (0.11)
Marginal tax rate on dividends	-0.088** (0.042)
Marginal tax rate on capital gains	-0.023 (0.04)
Progressivity of CIT	0.210 (0.14)
LN (GDP)	2.149** (1.05)
Unemployment rate	0.059 (0.04)
% of population at least Bachelor's degree	0.085*** (0.01)
LN (Per capita personal income)	0.071 (0.69)
LN (Industry wage and salary)	1.015*** (0.36)
LN (Industry employment)	-1.015 (0.71)
LN (Industry establishments)	0.150 (0.41)
Industry capital expense	0.416** (0.17)
Utilities industry dummy *Industry capital expense	0.824*** (0.19)
Manufacturing industry dummy *Industry capital expense	0.731*** (0.19)
Wholesale trade industry dummy *Industry capital expense	0.408** (0.20)
Information industry dummy*Industry capital expense	0.459** (0.22)
Real estate and rental industry*Industry capital expense	0.566*** (0.20)
Constant	11.624** (4.57)
Observation	5920
Adjusted R-squared	0.736

Notes: Entries are regression coefficients followed by standard errors in parentheses. The results are from the second stage of the IV estimation. The model includes state-industry fixed effects and year fixed effects. Industry dummies are interacted with industry capital expense and only the significant interactions are shown above to save space. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

Table 2.3: Panel Regression Results on State-Industry Corporate Share by Receipts

	Corporate Share of Total Receipts
GRT	0.311* (0.18)
Top CIT rate	-0.067*** (0.02)
Marginal tax rate on wage income	-0.441** (0.22)
Marginal tax rate on dividends	-0.185 (0.22)
Marginal tax rate on capital gains	-0.214 (0.21)
Progressivity of CIT	0.441 (0.41)
LN (GDP)	3.203** (1.50)
Unemployment rate	0.056 (0.07)
% of population at least Bachelor's degree	0.103*** (0.03)
LN (Per capita personal income)	1.011 (0.91)
LN (Industry wage and salary)	1.893*** (0.44)
LN (Industry employment)	-1.011 (0.91)
LN (Industry establishments)	0.301* (0.18)
Industry capital expense	0.415** (0.17)
Utilities industry dummy *Industry capital expense	0.634*** (0.23)
Manufacturing industry dummy *Industry capital expense	0.530** (0.24)
Wholesale trade industry dummy *Industry capital expense	0.605*** (0.20)
Information industry dummy*Industry capital expense	0.434** (0.21)
Real estate and rental industry *Industry capital expense	0.531*** (0.23)
Constant	22.056** (9.86)
Observation	5920
Adjusted R-squared	0.710

Notes: Entries are regression coefficients followed by standard errors in parentheses. The results are from the second stage of the IV estimation. The model includes state-industry fixed effects and year fixed effects. Industry dummies are interacted with industry capital expense and only the significant interactions are shown above to save space. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

that industries with higher salaries tend to have a greater corporate share. Consistent with previous literature, the corporate tax rate negatively affects the incorporation decision, pinpointing that increasing the corporate tax burden reduces the corporate share. The magnitude of the responses to corporate tax increases is more than double that in Goolsbee (2004). In addition, the higher the tax rate on dividends, the lower the corporate share. Further, the corporate share decreases with the tax rates on wage income.⁵³ One might expect that higher tax rates on wage income would encourage incorporation decision. However, given nonemployers may be both a wage income earner and the owner of a corporation, tax increases on wage income could discourage both activities if the activities are correlated. Moreover, the corporate share of total firms increases as industry capital expenses rise. Finally, five interactions of industry dummies with the capital expense variable show significantly positive impacts on the corporate share. Those industries, for example manufacturing, experience a larger increase in the corporate share than other industries as capital expenditures rise.

The results above evidence the impact of a GRT on the corporate share of total firms, but they do not show how the real activity of those corporations are influenced by a GRT. Therefore, the second measure of the corporate share, the percentage share of total receipts by C corporations, is used to perform the analysis. The results in Table 2.3 suggest that GRT states have a higher share of real economic activity done by C corporations. The point estimate is similar in magnitude although the significance decreases compared to the previous results. The corporate share of total receipts increases with industry capital expenses confirming the previous finding. Further, higher corporate income tax rates discourage the real activity of corporations. The magnitude of the real response to corporate income tax increases is slightly greater than that of the response in the share of businesses. For the other control variables, the results generally mimic the previous ones.

⁵³Replacing the average marginal personal tax rates on the three types of income with the top personal income tax rate results in an insignificant coefficient.

2.8 Conclusion

As more states show renewed interest in GRTs, understanding the incentives and impacts of GRTs becomes an important task for researchers and policy makers. Unfortunately, how GRTs actually affect the economy is largely unknown. This paper is the first empirical work on the influence of GRTs on organizational form choice. Based on the theoretical prediction that a GRT eliminates the incentive to distort organizational form choice arising under the CIT, I empirically test the influence of a GRT on the distribution of corporations within a state and industry. The results show that states with GRTs have a greater corporate share in a given industry, implying that GRTs reduce the distortion on the organizational form choice and firms are more willing to be C corporations. Furthermore, the results that GRTs positively influence both the corporate share of total firms and total receipts may suggest that CITs induce a significant reduction in the share of real activity done by C corporations. Of course, the empirical test in this paper is not a direct test. But it suggests that replacing CITs with broad-based taxes is a way to reduce the distortion on organizational form choice due to the neutral treatment on forms of businesses.

This paper provides important evidence for states that are considering GRTs as a replacement of CITs. In addition, it provides the first evidence on the effects of broad-based taxes. However, the paper suffers from the following limitations. Not many states levied a GRT or its variants in the window I examine, although exploring the variation across industries allows better identification of the effect. In addition, several states enacted GRTs in recent years; thus, the data do not allow me to investigate the long run effect. A longer panel will help provide more information. Further, the data for this analysis come from Nonemployer Statistics and the results may not be generalizable to other businesses. As mentioned earlier, the legal form of organization data for both employer and nonemployer firms at state and industry level are not available at the present. Nevertheless, if the results are found in the nonemployer data, one would expect to see similar results with employer data. It is

very important to conduct further research to understand the full potential effects of GRTs and to guide the policy debates on business taxes.

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Appendix

Appendix A

Appendix Proofs

A.1 Proof for Proposition 2 in Section 1.3

Let g be the profit function under a CIT and f be the profit function under a GRT. In addition, let z denote $1 - t^{GRT}$.

The retailer's before-tax profit under a CIT:

$$g(c^{up}) = \frac{1}{16}(1 - c^{up})^2$$

The retailer's before-tax profit under a GRT:

$$f(z, c^{up}) = \frac{1}{16} \frac{(3z^2 + c^{up} - 2z^3 - 2c^{up}z)(z^2 - c^{up})}{z^4}$$

When $z = 1$, $f = g$. Examining $\frac{\partial f}{\partial z}$ and evaluate it at $z = 1$, $\frac{\partial f}{\partial z} \Big|_{z=1} = -\frac{1}{8}(1 - c^{up})^2 < 0$. Over the interval, $z \in (0, 1]$, $\frac{\partial f}{\partial z}$ is C^1 smooth, hence, there exists an interval $[1 - \varepsilon, 1)$ where $\varepsilon > 0$ such that $\frac{\partial f}{\partial z} < 0$. Correspondingly, this means $f > g$ where $z \in [1 - \varepsilon, 1)$. Therefore, the retailer's before-tax profit under a GRT is higher than that under a CIT when the revenue neutral tax rate is very low under a GRT. This implies that the home state can use GRTs to shift profits to the retailer in its own state if the profit function for the downstream retailer is decreasing in z .

A.2 Proof for Varying Market Structure in Section

1.7

Vary the downstream market structure: n firms compete in the downstream market.

All assumptions are the same as in the baseline model except that there are n downstream firms competing on quantity. Let q_i denote downstream firm i 's quantity and q_{-i} denote the quantity produced by all other firms.

With a CIT, firm i solves the following problem:

$$\underset{q_i}{Max}(1-t)[(1-q_i-q_{-i}-W)q_i].$$

The solution gives the best response function for firm i . Assume symmetric equilibrium exists, the Cournot equilibrium quantity for each firm is $q^{CIT} = \frac{(1-W)}{1+n}$.

Then substituting the Cournot equilibrium quantity into the upstream firm's objective function yields:

$$\underset{W}{Max}(1-t)[(W - c^{up})\frac{(1-W)n}{1+n}].$$

Comparing the objective function for the upstream firm with that in the baseline model, one can see that the former one is simply a multiple of the latter one. Therefore the solution for W is the same, $W^{CIT} = \frac{1+c^{up}}{2}$. Consequently, $P^{CIT} = \frac{2+n(1+c^{up})}{2(n+1)}$.

Similarly, the same approach can be used to find the solutions under a GRT, except that a GRT taxes the gross receipts instead of profits. Therefore, firm i solves the following problem: $\underset{q_i}{Max}[(1-t)(1-q_i-q_{-i})-W]q_i$. The symmetric Cournot equilibrium is $q^{GRT} = \frac{1-t-W}{(n+1)(1-t)}$. The upstream firm then solves $\underset{W}{Max}[(1-t)W - c^{up}]nq^{GRT}$. Again, the objective function is just the multiple of the one in the single firm case under a GRT; thus, $W^{GRT} = \frac{1-t}{2} + \frac{c^{up}}{2(1-t)}$. Hence, $P^{GRT} = 1 - n \cdot \frac{\frac{1-t}{2} - \frac{c^{up}}{2(1-t)}}{(1-t)(1+n)}$.

Comparing the results under the CIT with that under the GRT suggests that Lemma 1 still hold since W^{CIT} and W^{GRT} are the same as in the monopoly case and $P^{GRT} > P^{CIT}$ (P^{GRT} and P^{CIT} are both monotonically decreasing in n and $P^{GRT} > P^{CIT}$ when $n = 1$). So the vertical integration argument is still applicable.

Further, comparing the difference in the profit per unit between the two tax regimes yields:

$$\frac{\partial[(P^{GRT} - W^{GRT}) - (P^{CIT} - W^{CIT})]}{\partial n} = \frac{\partial(P^{GRT} - P^{CIT})}{\partial n} = \frac{1}{1+n} \left[\frac{\frac{1}{2} - \frac{c^{up}}{2}}{1+n} + \frac{\frac{1-t}{2} - \frac{c^{up}}{2(1-t)}}{(1+n)(1-t)} \right],$$

where the first and second terms in brackets are just the quantities under both tax regimes. Hence, $\frac{\partial[(P^{GRT} - W^{GRT}) - (P^{CIT} - W^{CIT})]}{\partial n} > 0$. Accordingly, $\frac{\partial[q^{GRT} - q^{CIT}]}{\partial n} < 0$. Therefore, if the percentage increase in per unit profit difference is greater than the percentage decrease in the quantity difference, the profit shifting result holds.

Appendix B

Appendix Table

Table B.1: States with GRT-related Taxes

State	Items Taxed
Delaware	Gross receipts tax on all non-exempt goods or services rendered. Rates range from 0.096 percent to 1.92 percent depending on business activity, in addition to place-of-business fees ranging from \$25 to \$75 per location: <ul style="list-style-type: none"> ● Manufacturers: 0.180 percent. ● Wholesalers: 0.307 percent. ● Retailers: 0.576 percent. ● Restaurants: 0.499 percent. ● Food Processors: 0.154 percent. ● Petroleum Products Wholesalers: 0.384 percent, plus a hazardous substances tax of 0.9 percent, plus a surtax of 0.192 percent. ● Occupational/Professional/General Services: 0.384 percent. ● Additional rates for more specific industries.
Kentucky	Alternative minimum calculation for business taxes of 0.095 percent gross receipts or 0.750 percent of gross profits. Kentucky school districts may levy a 3 percent gross receipts tax on utilities.
Michigan	Michigan's new business tax, the Michigan Business Tax, replaced the Single Business Tax as the primary privilege tax effective January 1, 2008. The Michigan Business Tax consists of two individual taxes, a business income tax and a modified gross receipts. State government is authorized to levy nine types of business privilege taxes in Michigan, and local government is authorized to levy one type of business privilege tax.
Ohio	Commercial Activities Tax (CAT) enacted in 2005, to be phased-in over a five-year period. When fully phased-in, rate is 0.26 percent of gross receipts. Imposed on all activity, legal or illegal, that is conducted for or results in gain, profit, or income. Utilities are taxed separately at 4.75 percent, except oil pipelines, which are taxed at 6.75 percent.
Texas	Effective January 1, 2007: General gross receipts tax. Rate is 1 percent, calculated on the minimum of either a) total revenue minus total cost of goods, or b) total revenue minus total compensation and benefits. Wholesalers and retailers are taxed at 0.5 percent.
Washington	Business & Occupation (B&O) tax, the nation's oldest general gross receipts tax. Rates vary widely based on industry: <ul style="list-style-type: none"> ● Manufacturing Dairy Products: 0.138 percent. ● Travel Agent Commissions: 0.275 percent. ● Retailing: 0.471 percent. ● Wholesaling: 0.484 percent. ● Manufacturing: 0.484 percent. ● Gambling Contests of Chance: 1.5 percent. ● Additional rates for more specific industries.

Source: Chamberlain and Fleenor (2006).

Vita

Zhou Yang was born in Wuhan, China. Prior to studies in the US, she had been working for four years on regional economic development policies and industrial planning in China. Her major fields are public finance and industrial organization and her minor field is applied econometrics. She is very interested in conducting both empirical and applied theoretical research with a focus on public policy. Thus far, her research has concentrated on state tax policy and tax competition among state governments. She has published in refereed journals and written a book chapter with coauthors focusing on business taxes. In addition, She is interested in various issues related to education, economic regulation, market structure and pricing, and health care policy in general.